

Montana State Legislature

2011 Session

Exhibit II

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MONTANA BUREAU OF MINES AND GEOLOGY

Biennial Report of Activities and Programs

July 1, 2008 to June 30, 2010

EXHIBIT 11

DATE 1/19/2011

HB



A department of Montana Tech of The University of Montana



DIRECTOR'S INTRODUCTION

**New building, new programs, new people, new data:
change is not an option, it's mandatory.**

The just-completed biennium has to be one of the most eventful in the history of the Montana Bureau of Mines and Geology (MBMG). In December 2009 we began moving from Main Hall, the oldest building on Montana Tech's campus and our home since 1919, to the brand new Natural Resources Building on the west side of campus. Part of the MBMG's enabling legislation directed us to collect various things...a task that in some aspects we've done remarkably well, so serious house cleaning was launched well ahead of the move. It still took about a month to complete, plus time for settling in. Considering that we're geologists, there were remarkably few rocks to move, but there were tons of files and documents. We left Main Hall with serious regrets, but we're benefiting from having modern space that was designed with our needs in mind. The Mineral Museum had to remain in its old space, but changes are also happening there with the installation of new cabinets, exhibits, updated lighting, and revised staffing.

Geologic resources were certainly on the mind of the 2009 Legislature, as it established three new programs in the MBMG. HB 333 directs us to conduct research on Montana's geothermal resources and evaluate costs of development, and SB 297 established a sand and gravel evaluation program. Neither bill was funded, but we have obtained external grant funds that enable us to pursue geothermal data collection in a very modest way, and sand and gravel mapping now receives increased emphasis in our yearly STATEMAP grant proposal.

HB 52 established and funded the Ground Water Investigation Program (GWIP). This legislation was driven by growing conflicts over surface water and groundwater rights and resources. The program is directed to provide detailed reports on groundwater resources at the sub-basin level. It complements the long-established Ground Water Assessment Program (GWAP), which more broadly addresses statewide groundwater assessment and monitoring. Unfortunately, the status of future funding for GWIP has been

uncertain, and about 20 percent of the anticipated second-year budget was lost as part of university-system budget reductions. This has created problems with attaining intended staffing levels. Despite these obstacles, the program is on track to deliver reports on seven sub-basins as originally planned, although the scope for two sub-basins will have to be somewhat reduced.

With all the changes in 2009, the MBMG's 90th anniversary quietly slipped by with little notice. Our basic mission of mapping and evaluating the State's geologic resources has remained unchanged over the decades. It still holds true that nearly every investigation depends on good geologic maps, whether they depict bedrock, mineralized zones in an ore deposit, or gravels that form aquifers. Not too many years ago, a project ended with a written report and/or geologic map, with or without a few tables of data, and went through technical reviews and editing to become a static paper publication. At this point, past and present operational practices diverge greatly.

We now generate huge amounts of data that cannot fit neatly on geologic maps or adequately in a report. Databases have become just as great a necessity as geologic maps, and the need to connect databases with each other and with geologic maps is a constantly moving and increasingly complex target. By itself a data point is just a number. In our work, successful interpretation requires that it be evaluated with other data points and with respect to the geology of the site or area. Each data point must also have geographic coordinates in three dimensions, so the information can be tied to the real world. In situations such as repeated measurements of water levels or water quality at a particular site, time is added as a fourth dimension. Without computers...where would we be?

Today, rather than a one-time press run of high-cost paper maps, our new geologic maps are digital, printed on demand, and can be updated as new information warrants. We now provide an

unprecedented amount of information, and much of it can be downloaded from our website at no cost.

Our customers have responded. During the FY 2007–08 biennium, we sold 15,788 paper copies of publications and digital copies were downloaded 218,750 times. For the FY 2009–10 biennium, the paper sales dropped to 10,797 copies, but digital copies nearly doubled to 434,357 downloads. Additionally, each month users of our Ground Water Information Center database logged in nearly 3500 times and viewed more than 1.8 million data records in response to their queries.

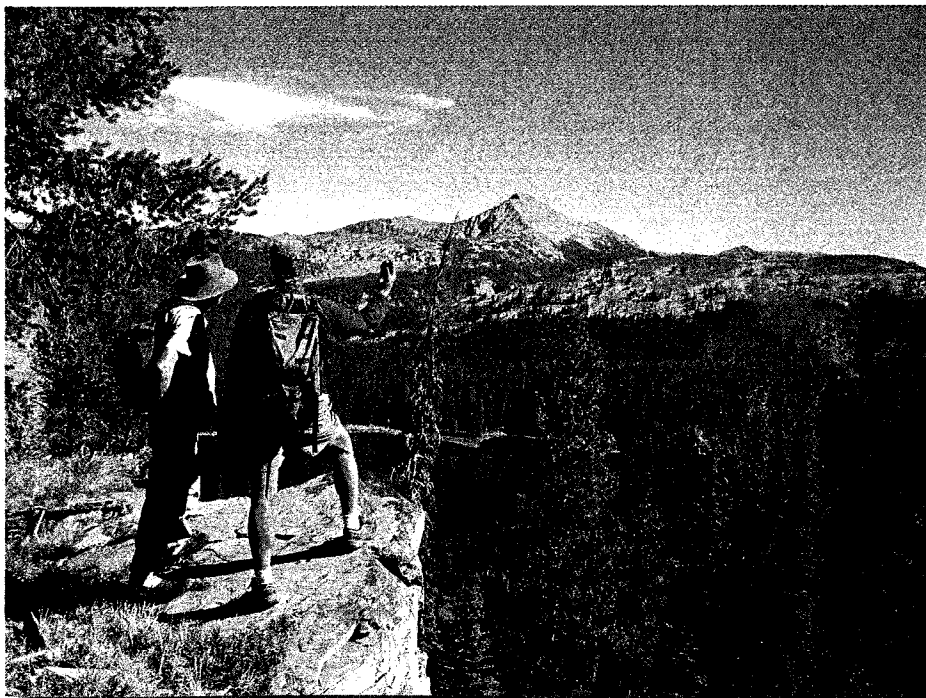
In the following pages, you will find brief descriptions of the activities of some of our programs and projects. Despite the fact that these are presented separately, all our programs contribute to a common pool of information that is becoming easier to mine for more complete answers to multiple problems. We've again tried to keep this report non-technical, but if you would like more information on any topic, please feel free to contact us.



Edmond G. Deal
Director and State Geologist

Data Preservation Project

It is important to recognize that "old" data may have immense value. Unfortunately over the years great amounts of old geologic data have been lost. For example, many exploration companies went out of business and truckloads of documents as well as cores and cuttings from test wells, costing millions of dollars, simply disappeared; data from many environmental investigations went into reports that were tossed out or relegated to a forgotten shelf; aerial photograph collections that are hugely valuable for documenting changes in the landscape and vegetation over decades of time have been discarded for lack of space. The MBMG is a participant with the Association of American State Geologists and the US Geological Survey in an effort to rescue endangered data and preserve it in the various state geological surveys. This attempt has received a modest amount of federal funding, but far less than needed to secure the data at risk.



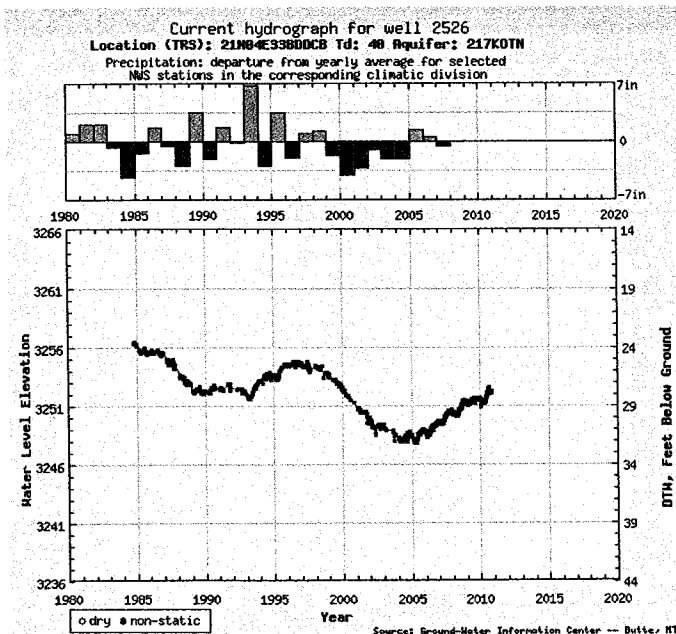
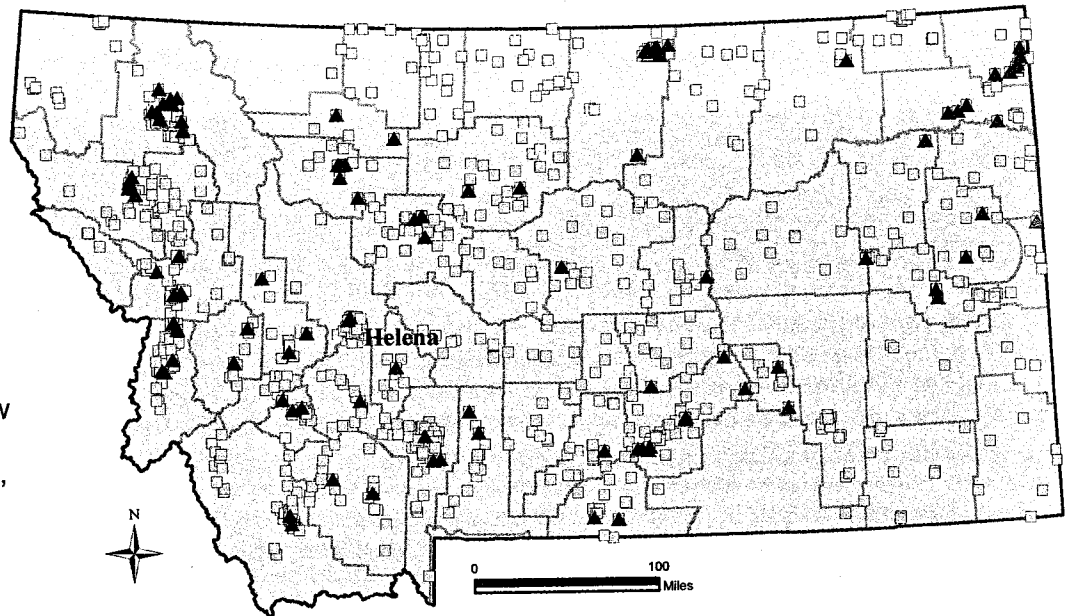
GROUND WATER ASSESSMENT PROGRAM

The Legislature established the Ground Water Assessment Program in 1991 after considering the recommendations of a Ground Water Task Force organized by the Environmental Quality Council. Statute specifically requires systematic monitoring and assessment of aquifers to improve understanding of Montana's groundwater resources. As part of a mandate to make groundwater information widely available, the Assessment Program includes the Ground Water Information Center (GWIC) database at the MBMG.

The Legislature also created an interagency Steering Committee that selects study areas, addresses the need for better coordination among State, Federal, and local government units, and oversees Assessment Program progress.

Ground Water Monitoring

The Ground Water Monitoring Program collects quarterly water-level measurements from 954 wells strategically located across the entire State, as shown by the yellow squares on the map at right. Red triangles mark locations of continuous water-level recorders. Long-term groundwater-level records (see hydrograph for well 2526, below) are the only direct measure of how Montana's aquifers respond to seasonal, climatic, developmental, or land-use factors. Long-term groundwater hydrographs are similar to long-term records of



stream flow and precipitation, and must be evaluated at decadal scales. For example, information from the Ground Water Monitoring Program helps people understand the impact of drought on groundwater levels. In 2002, almost 85 percent of climate-sensitive network wells were below their seasonal averages; in June 2010 Montana's drought had moderated and only about 60 percent of the wells were below their seasonal averages. Ground Water Monitoring also collects water-quality samples to create long-term records of baseline water quality; the program collected 177 water samples during the biennium.

In an effort to improve efficiency and provide more timely water-level data from critical locations, the Ground Water Monitoring Program has installed three telemetry units to gather and send data directly to the Ground Water Information Center database. A photograph of the Deer Lodge Valley telemetry site is at right.

GWIC TICKER:

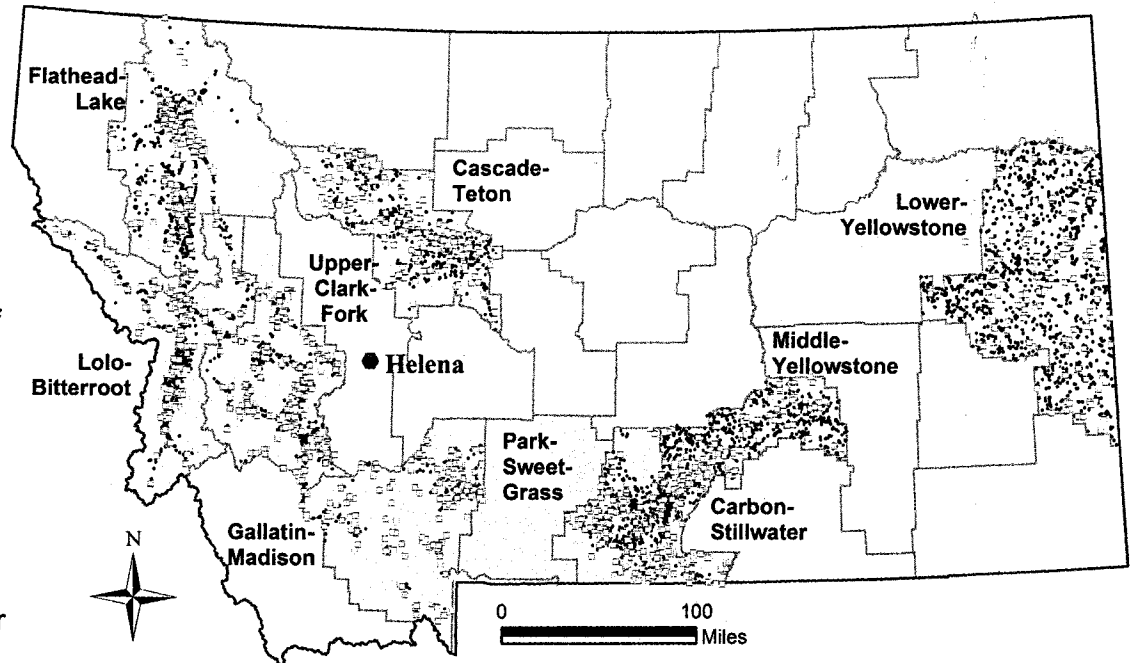
19,370 registered users...3,500 sessions and 34,000 queries each month...Information on 229,792 wells and boreholes...Scanned

Ground Water Characterization Program

The Characterization Program provides basic information about aquifers within specific areas as prioritized by the Ground Water Assessment Steering Committee. The locations for more than 8,950 site visits (dots) and 2,100 samples (yellow squares) generated by Characterization Program staff are shown on the map at right.

Fieldwork has been completed in the Cascade-Teton area and is ongoing in the Gallatin-Madison area. The Steering Committee has selected the Park-Sweet Grass characterization area for future work. Characterization Program staff have described

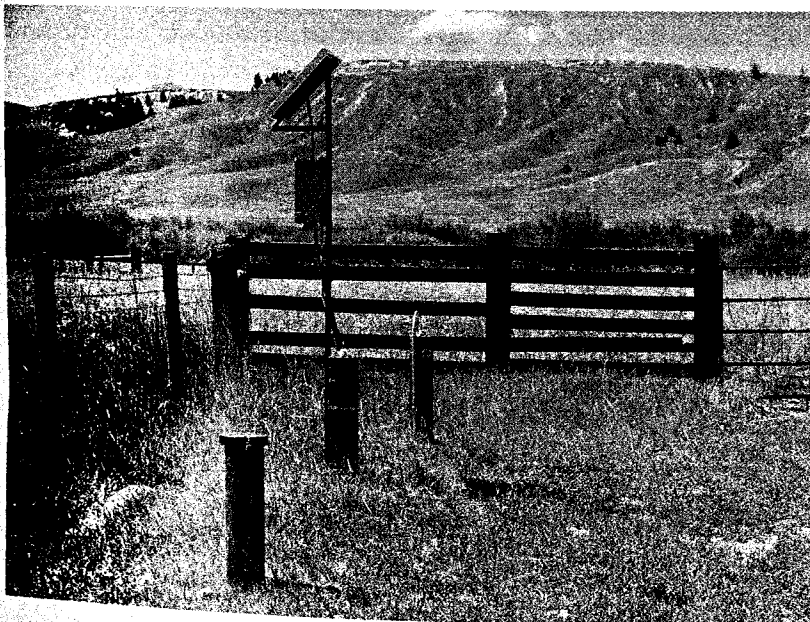
the hydrogeology of the 22 counties currently covered by active/completed groundwater characterization studies with two atlases, 42 maps, and 10 open-file reports. Between July 2008 and June 2010, customers retrieved 45,516 copies of Characterization Program maps and reports from the GWIC/MBMG websites.



Ground Water Information Center (GWIC)

GWIC customers seek groundwater data generated by MBMG projects, logs from water-well drilling, and results from water-quality sampling. GWIC offers geographic, address, subdivision, drainage basin, aquifer, and county searches, which allow customers broad choice in how to retrieve data. Users can choose from 13 report formats to customize retrievals. During the past biennium GWIC staff completed a 'first pass' through the main body of well logs, scanning and attaching the document images to database records. The scanned images are popular with customers who may prefer to have an image of the well log in addition to GWIC's digital record.

On July 1, 2004 drillers began filing water-well logs directly with the MBMG. Statute also allows the MBMG to accept electronically filed logs. Between July 1, 2008 and June 30, 2010 almost 3,136 water-well logs (almost 30 percent of all logs) were filed electronically through GWIC's "DrillerWeb" tool.



Images for 207,496 well logs...Results from 52,617 water-quality analyses for 16,215 sites...6.4 million water-level measurements

GROUND WATER INVESTIGATION PROGRAM

The Legislature's 2007/2008 Water Policy Interim Committee (WPIC) recognized that competition for water resources and the lack of detailed information on groundwater/surface water interaction has challenged informed water-resource management and development in Montana. The WPIC found that "continued and expanded study of groundwater resources is vital to shaping statewide policy as well as providing the data necessary for local decisions regarding water." The Ground Water Investigation Program was funded by the 61st Montana Legislature to complete 6 to 8 projects per biennium, and operates under the oversight of the Ground Water Assessment Steering Committee. Additional information is available at <http://www.mbm.mtech.edu/gwip/gwip.asp>.

MAP OF PROJECT AREAS:

*Green, projects for 2009–2011
Red, planned projects for 2011–2013;
Pink, proposed future GWIP projects.*



- | | | | |
|--------------------|------------------------|----------------------|----------------------------|
| 1 Eureka | 11 Greenfield Bench | 22 Little Belt Mts | 33 Coalbed methane |
| 2 Flathead Valley | 12 North Hills | 23 Stillwater Valley | 34 NF Flathead |
| 3 Smith Valley | 13 Scratchgravel Hills | 24 Rock Creek | 35 Lower Beaverhead W. |
| 4 Noxon | 14 Townsend, Toston | 25 Pryor Mts | 36 Big Sky |
| 5 Missoula Valley | 15 Three Forks | 26 Park City | 37 Boulder River |
| 6 Florence | 16 Manhattan | 27 West Billings | 38 Madison Valley Quake |
| 7 Hamilton | 17 Belgrade | 28 East Billings | Lake to Ennis |
| 8 Georgetown Lake, | 18 Four Corners | 29 Roundup | 39 Madison Valley Ennis |
| Philipsburg | 19 Pine Creek | 30 Flaxville Gravels | to Three Forks |
| 9 Summit Valley | 20 W. Yellowstone | 31 Clear Lake | 40 Jefferson Valley |
| 10 Priest Butte Lk | 21 Belt, Monarch | 32 Sidney | 41 Stevensville Bitterroot |

Program Status: Forty-one projects have been nominated and prioritized by the Ground Water Assessment Steering Committee. Prioritization was based on land use changes, anticipated growth in housing, agriculture, industry, and commercial activities. Seven sites were selected for the 2010–2011 biennium, and those projects are expected to be completed by June 2011.

Program Products: Every GWIP investigation is expected to produce: (1) a detailed report on the hydrogeologic system and stresses; (2) a computer model that simulates specific hydrogeologic features and future stresses; and (3) a comprehensive set of hydrogeologic data available online through the Ground Water Information Center.

Montana water utilization will be supported by these products, which will be used by scientists and engineers representing agencies, senior water-right holders, new applicants, and other stakeholders. All data that have been collected are currently available to the public at <http://mbmggwic.mtech.edu/>.